# EMI/EMC* Emissions and Susceptibility Testing & Consulting

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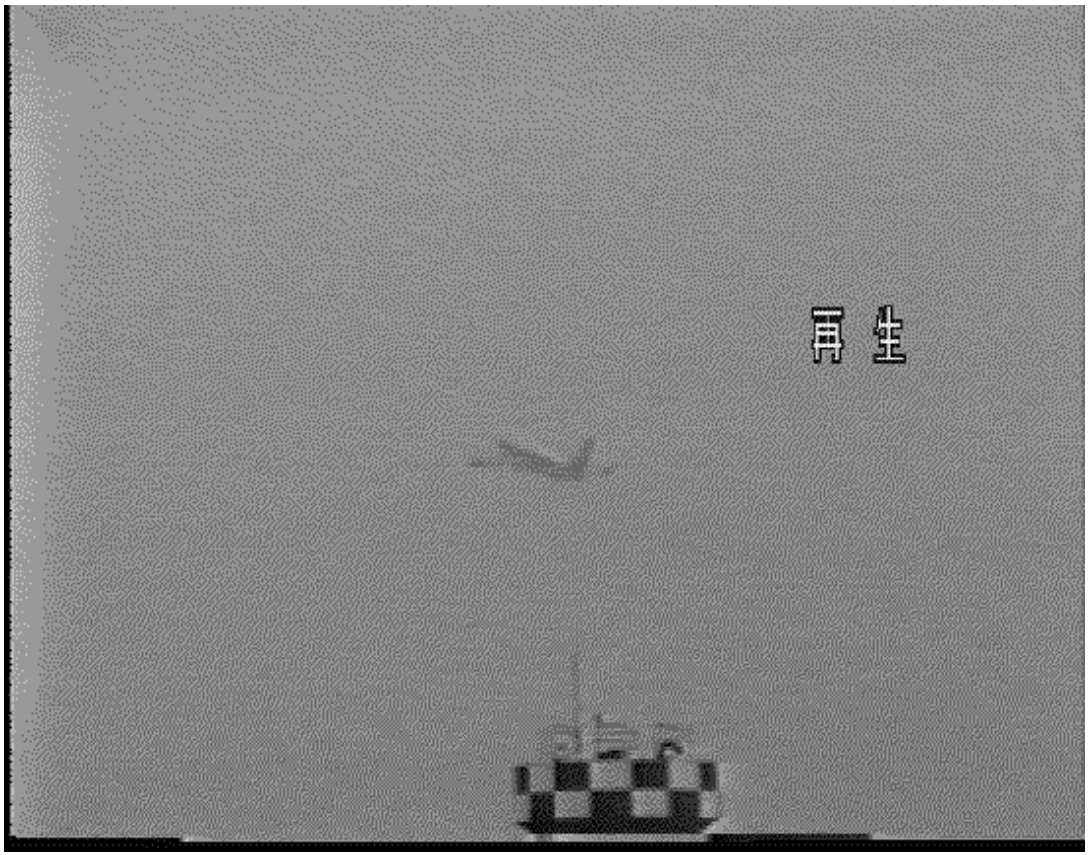
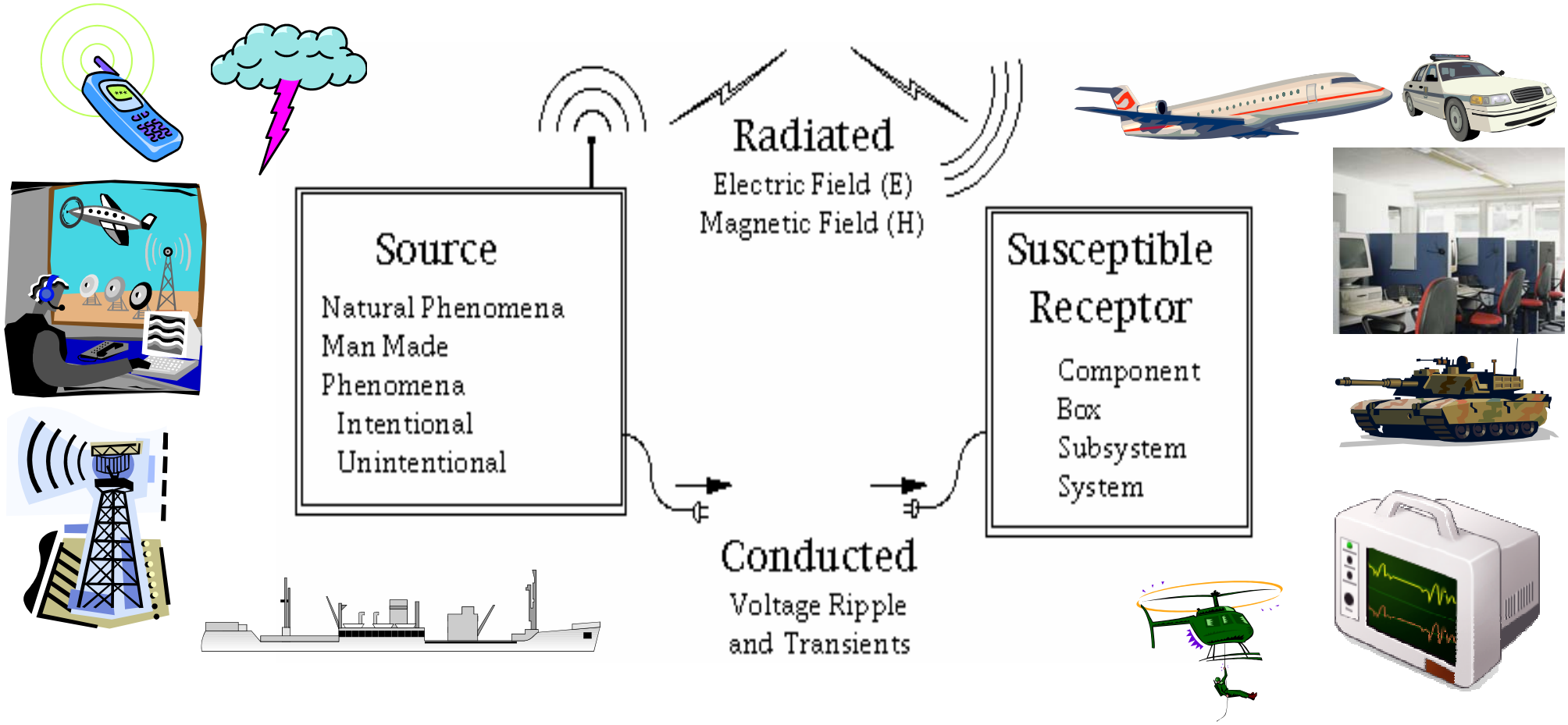
*Electromagnetic Interference/Compatibility



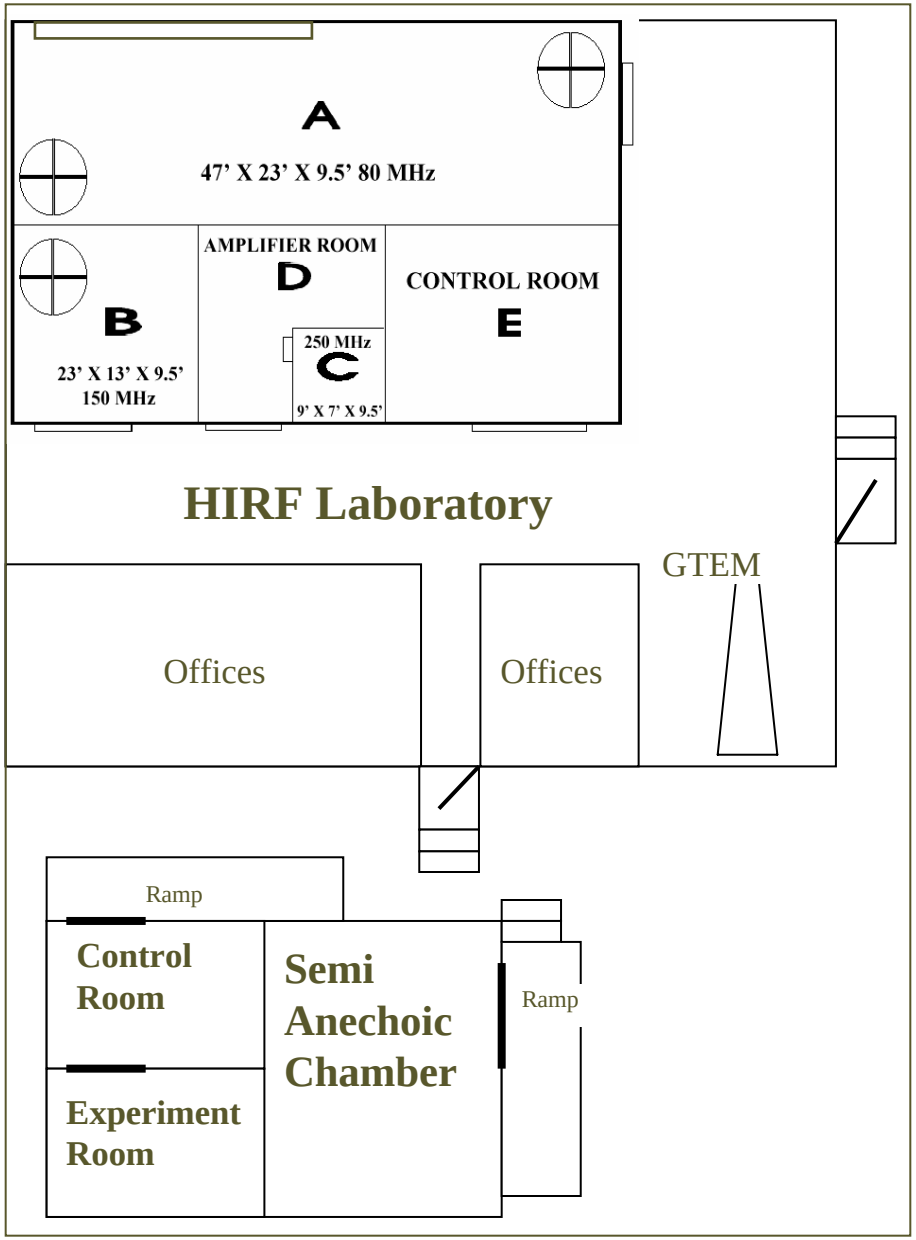
# EMI?, HIRF?, What's the Problem?




- 3 Parts to any EMI problem: Source→Path→Victim
- "HIRF" is part of the ***severe electromagnetic environment*** that many aerospace vehicles, automobiles, and broadcast /radar/communication facilities are subjected to.

# High Intensity Radiated Fields Laboratory

- **Not Just HIRF**
  - RF Emissions
  - Lightning
- **Today's Tour!**

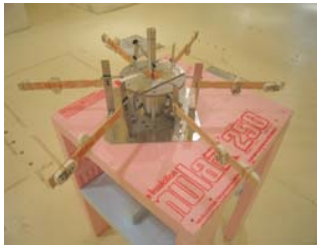



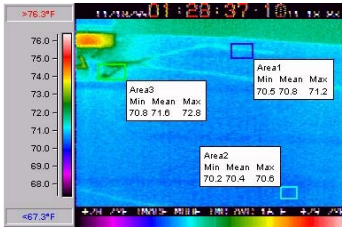

**The HIRF Lab can generate HIRF/Lightning environments and measure device/system emissions**

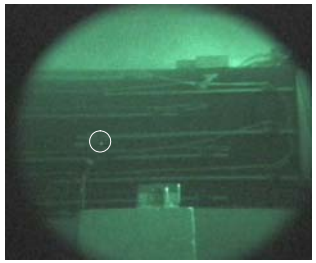
# HIRF Laboratory Purpose

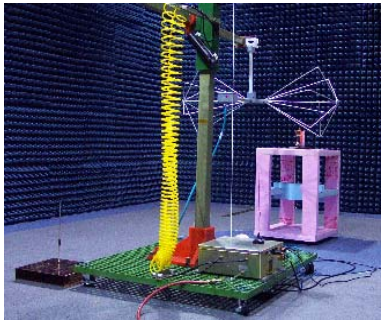
- Generate HIRF environments to study avionics-upset, thus contributing to the development of fault-tolerant software and hardware architectures for future avionics systems.
- Personnel measure radio emissions from wireless devices (mobile phones, RFID, wireless LANs/PANs), and evaluate their electromagnetic compatibility (EMC) with airplane electronic systems.
- Personnel perform extensive airplane coupling measurements and computational RF propagation modeling. The data play important roles in shaping many aeronautical standard documents.

➢ HIRF lab researchers have contributed to NTSB accident investigations, RTCA Test Processes, Spectrum Policy Studies and EMI-attack assessments on avionics.



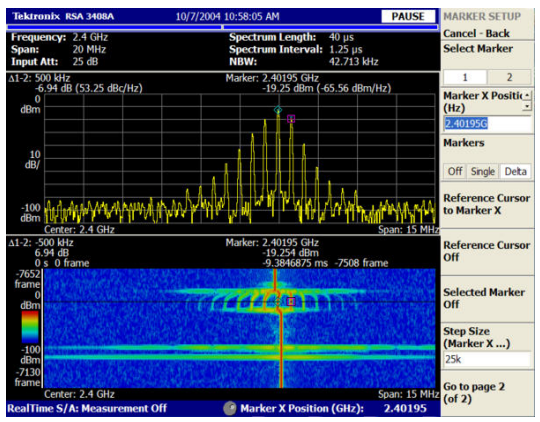



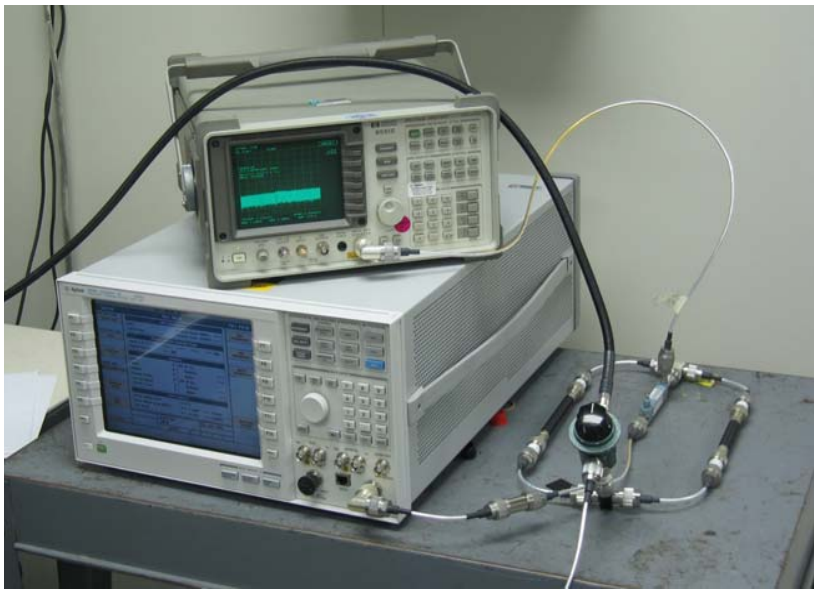





# HIRF Laboratory Resources

- Broadband RF Amplifiers: DC to 18GHz, Over 1000W
- Reverberation Chambers, TEM Cells, GTEM (Semi-Anechoic/Full-Anechoic available on-site)
- Lightning & Impulse Generators
- Signal Sources -Scalar/Vector DC to 18 GHz, Cellular Base Stn.
- Signal Measurement -Spectrum/Network Analyzers, Scalar/Vector to 18GHz, Oscilloscopes

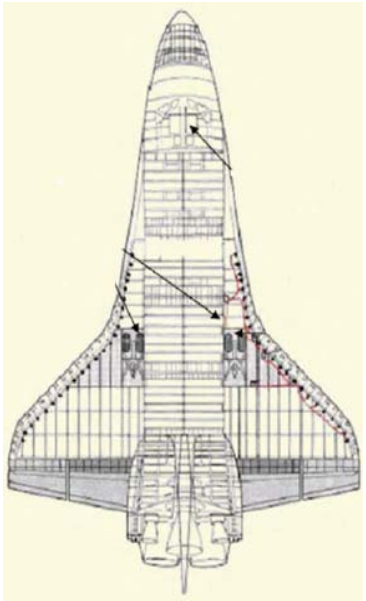


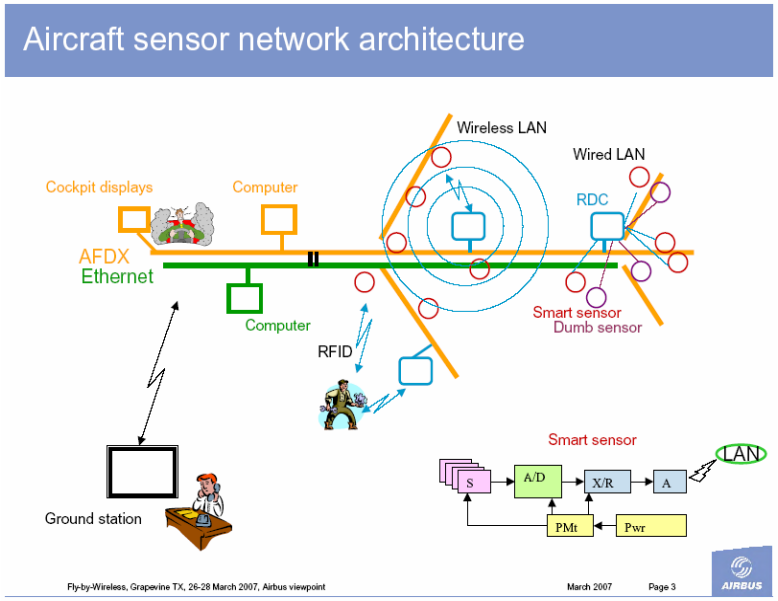



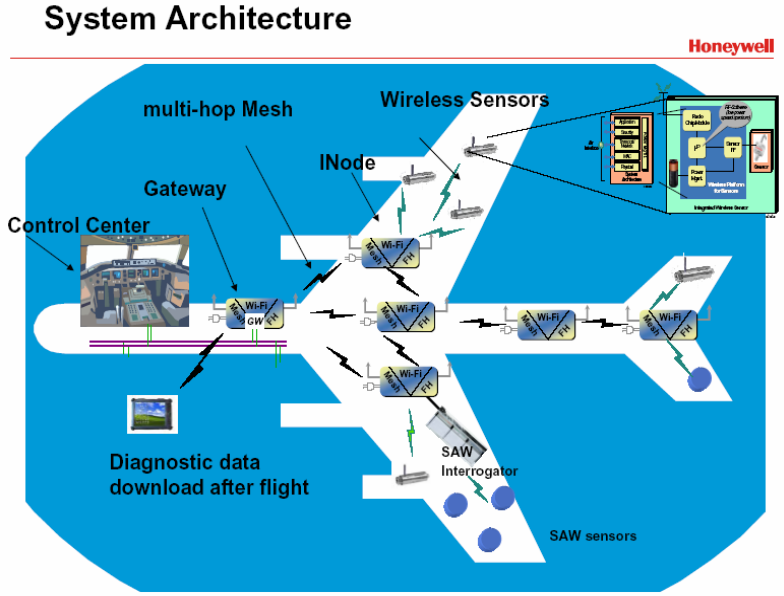
# Future Wireless Challenges

- Future airplanes will require thousands of wireless sensors for monitoring vehicle system health, flight environment and structural integrity.
- New optical data networks and wireless architectures will be used for many vehicle functions, including safety-critical ones.
- Light-weight composite materials will need improved lightning damage assessment technologies, which will include on-board wireless sensor networks.

➢ Compatibility with the worldwide EM environment is essential for safety, efficiency and security.

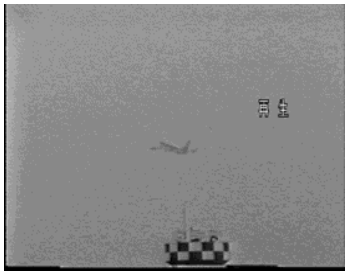




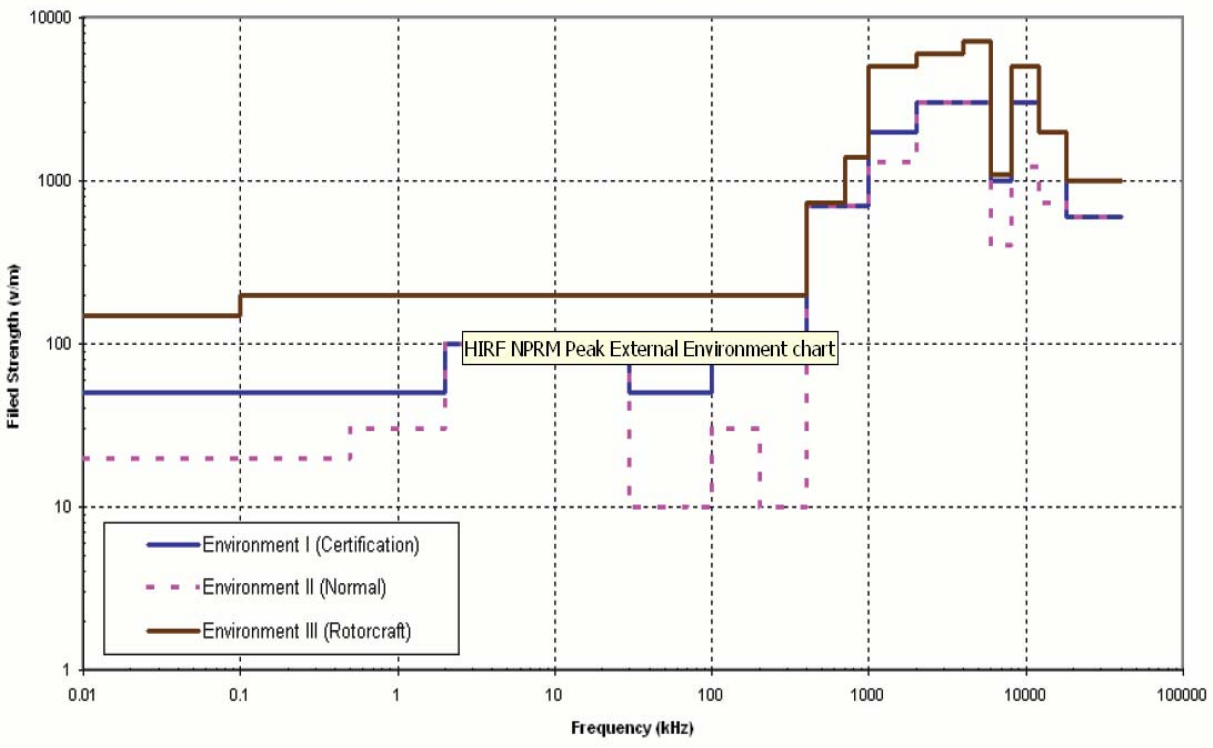




# Lightning/HIRF/PEDs "The Old and the New"





- Damage from Lightning Strikes on new, non-aluminum fuselages is difficult to inspect. Indirect effects penetrate deeper into on-board avionics.
- The HIRF Test Environment for certification of new airplanes has steadily increased over the last 20 years, and will continue to increase and include additional test modulations.
- Airline passengers will increasingly rely upon wireless portable electronic devices (PEDs). PEDs will operate in new RF bands auctioned & approved by the FCC. Airlines will continue to relax wireless device restrictions. **PEDs and on-board wireless infrastructure must not interfere with one another.**


- **What's Next in Wireless?**
- **How may it affect Aviation? Transportation? Medical? Manufacturing? Shipping? Retail? Infrastructure?**

# EMI/EMC Partnership Opportunities

- **Use NASA's Facility**
  - Multiple Reverberation Chambers Co-Located
  - Huge Door Access to Chamber "A" from Parking Lot (suitable for small aircraft & UAVs)
  - Nearby Semi-Anechoic Chamber
  - RF Amplifiers, Lightning Equipment, Vector/Scalar RF Sources and Receivers
- **EMI/EMC Consulting**
  - Lab Testing/Field Testing
  - Experience with RTCA, FAA, MIL, DOD, AFRL, NTSB, NIST,….

# Collaborating & Partnering With NASA

- **IVHM NRA's**
  - Topic IVHM-3.1: Environmental Hazards. EMI Threat Detection, Quantification, Characterization & Mitigation. $650K FY08
  - http://www.aeronautics.nasa.gov/nra.htm
- **NIA/NESC/SBIRs**
  - Wireless Sensors & Architectures for on-board Instrumentation and Improved Aerodynamics
- **Other NASA Centers**
  - JSC: Spacecraft Wireless, GRC: Aircraft Wireless Architecture, Others?

# Please Tell Us Your Ideas!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If you have further questions today, please see a Partnership Consultant member

(look for a Bright Yellow badge)

or visit the booth on
How to work with Langley

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